

Selected Occurrences

I. LABORER SEVERELY INJURED WHEN JACKHAMMER HITS BURIED 13,200 VOLT LINE

- A. **Summary:** On January 17, 1996, a laborer at the Los Alamos National Laboratory was burned and rendered unconscious when he hit a buried 13,200-volt electrical power cable with a jackhammer while excavating in the basement of Building 209 in Technical Area 21. Building 209 houses the Laboratory's Tritium Science and Fabrication Facility. The laborer's foreman immediately notified the Tritium Science and Engineering group office and a secretary called 911. Medical personnel responded and transported the laborer and foreman to the Los Alamos Medical Center. Electrical power to the building and surrounding buildings was disrupted; however, no abnormal amount of tritium was released during the loss of building power. This event is significant because the laborer was unaware of the electrical hazard because of poor work control. As a result, he is hospitalized and listed in critical condition with serious burns. (ORPS Report ALO-LA-LANL-rSF-1996-0001)
- B. **Description:** The laborer and foreman were excavating for installation of a sump pump in the building basement. The project required them to remove a section of the concrete floor and dig a 3 foot-deep hole in the southwest corner of the basement. The foreman and laborer removed the section of concrete and began removing the earth. The laborer and foreman were wearing personal protective equipment consisting of gloves, safety-toe shoes, hard hats, and eye and ear protection. They were taking turns using a jackhammer and shovel to remove the earth.

Investigators said the laborer gave the foreman the shovel and started using the jackhammer and shortly after that the foreman observed the laborer holding the jackhammer and shaking, followed by an explosion. When the laborer started to fall into the hole the foreman pulled him partially out and ran for help. The facility manager designee and a secretary arrived at the scene first and administered CPR until emergency medical personnel arrived. The foreman suffered from smoke inhalation and was released that day from the Los Alamos Medical Center; the laborer was later moved from the Center to a hospital in Albuquerque.

Electrical power supply to Building 152, the Tritium Systems Test Assembly (TSTA-155), and the Tritium Science and Fabrication Facility (TSFF-209) was disrupted. The TSTA diesel generator automatically started and supplied electrical power to all critical safety loads at TSTA-155 and the ventilation exhaust blower at TSFF-209. The TSFF-209 tritium stack monitors, fire protection, and security systems were powered from uninterruptible power supply batteries. Laboratory safety engineers and utilities personnel grounded the electrical line to TSFF-209, tagged out the power supply, and restored electrical power to Building 152 and TSTA-155. Utilities personnel cleared debris from the excavation hole and verified that the 13,200-volt cable was de-energized. Electrical power to TSFF-209 is being temporarily supplied by a portable diesel generator.

C. **Lessons Learned:** Facility managers conducted a critique of the occurrence and determined that

- safety engineers had not performed a review to identify health and safety hazards before the job started.

Although the standing work order had received a safety review,

- the individual work tickets directly associated with the work order had not been reviewed.

In this case, even though a work ticket was written against the standing work order, the craftsmen did not know that an excavation permit and an environment, safety, and health review were required for concrete cutting and sub-slab excavation inside a building.

- The protective equipment the jackhammer operator wore was an ineffective barrier against the 13,200-volt electrical hazard.

D. **Corrective Actions:** Facility maintenance managers issued a stop work for all standing work orders pending review by environment, safety, and health safety engineers. All excavation and penetration operations were stopped until policies and programs could be reviewed. On January 19, safety engineers issued a safety alert regarding the incident.

As a result of this event, two directives were issued at Los Alamos National Laboratory. On January 17, 1996, the Laboratory's support services contractor immediately suspended excavation jobs and ground and wall penetration work until a hazard analysis was completed. On January 18, Laboratory managers initiated a moratorium suspending all maintenance, construction, environmental restoration, and D&D activities unless a safety hazard analysis was performed. Special attention was given to excavations or penetrations of surfaces where workers might encounter energized electrical wiring or components. Only one week after these directives were issued, the following event was reported at Los Alamos National Laboratory.

On January 25, 1996, inspectors at the High Explosive Machining/processing facilities discovered a violation of the construction work moratorium. They observed concrete pad penetration work during a construction safety inspection of a project site. Managers immediately enforced the stop-work order. (ORPS Report ALO-LA-LANL-HEMACHPRES-1996-0001)

A preliminary investigation revealed that the project leader was aware of the moratorium, and had suspended some activity. However, he decided to drill 3/8-inch diameter holes, approximately 2 1/2-inches deep, for hilti-type bolts in a concrete corridor building without a supplemental formal safety hazard review as directed by the two moratoriums. A standing work order for this job had received an overall safety review, but both moratoriums stated that any work order supplemented by additional work instructions required an additional safety review before work could begin. The standing work order process and status of the safety hazard review at this facility was similar to that in the jackhammer event that initiated the directives. A contributing cause of this event was that work planners failed to identify the need to de-energize power to the building, or provide a lockout/tagout for circuits known to be in the vicinity of the trench work.

II. TECHNICAL STAFF MEMBER INJURED IN FORKLIFT ROLLOVER ACCIDENT

- A. **Summary:** On November 22, 1995, a technical staff member of Los Alamos National Laboratory suffered a broken jaw and fractured vertebrae when the forklift he was operating rolled over on him. A technician working with the technical staff member to replace gas cylinders summoned emergency assistance and lifted the forklift's overhead guard off the technical staff member's neck. Emergency personnel extracted the technical staff member and transported him to the hospital. This event is significant because the technical staff member was not trained or certified to operate the forklift. As a result of the accident he required a seven week hospitalization.

B. **Description:** A Chemical Science and Technology (CST-12) Division technician noticed that three gas cylinders providing gas to instruments needed replacing to ensure adequate gas flow during the Thanksgiving holiday. The regular forklift operator, was on vacation that day. A technical staff member in the area to work on software, agreed to assist the technician in moving full cylinders from the storage rack. The technical staff member obtained a forklift and set the forklift tines into the slots of a gas cylinder rack attachment.

The technical staff member drove the forklift up over a 3 to 4 inch curb at the edge of the building by using a rocking motion to get the forklift over the curb and onto the building apron, stopping the forklift once it was fully on the building apron. The forklift left skid marks and scratches on the building apron.

The technical staff member slowly drove the forklift forward, reaching part of the building apron that was partially restricted by an electrical box and some bar stock. The technical staff member observed that the left front wheel of the forklift was near the edge of the building apron and turned away from the edge. The rear of the truck moved towards the edge and a rear wheel passed over the edge. The forklift slid off the building apron and toppled onto its side. It came to rest on the grassy slope of a drainage ditch adjacent to the building apron. The technical staff member was pinned underneath the overhead guard and was in a fetal position with the top of the guard lying across the neck, just below the jaw line. His left foot was pinned beneath the body of the forklift.

The technician summoned emergency responders, returned to the scene and with the help of other local personnel, was able to lift the forklift's overhead guard off the technical staff member's neck and support the guard on wooden blocks. The technical staff member's face had turned purple but once the guard was lifted off his/her neck, facial color began to return to normal. This rescue effort is recognized as probably instrumental in saving the technical staff member's life and certainly prevented the occurrence of further injury before professional rescue personnel arrived.

After arriving at the accident scene, the fire department required 17 minutes to extract the technical staff member from the overturned forklift, hampered by his pinned foot. The technical staff member was unconscious and unresponsive; cyanotic, but breathing on his own; and bleeding from the mouth.

- C. **Lessons Learned:** The technical staff member indicated he was aware of the Laboratory requirements for forklift operation, but was not a licensed operator, and had not received any forklift training.
- D. **Corrective Actions:** Laboratory management immediately suspended all Laboratory forklift operations. The moratorium required each Laboratory organization that owned or operated forklifts to submit information including a list of licensed operators, a list of forklifts, and inspection and maintenance records. After review by a forklift restart committee, forklift operations were restarted on a case by case basis.

III. IMPROPER LOCKOUT/TAGOUT DISABLES AIR COMPRESSORS

- A. **Summary:** On March 1, 1996, at the Savannah River Tritium Facility, a maintenance mechanic placed "Do-Not-Operate" tags on two valves without authorization, that isolated cooling water, disabling two of three operating instrument air compressors. An operator, mistakenly considered the loss of the air compressors an emergency, and opened the two cooling water valves with Do-Not-Operate tags and notified the shift operating manager of this operation. The shift operating manager realized that the operator should not have operated the valves and informed the shift manager, who ordered the tags removed and the air compressors returned to service. This event is significant because unauthorized actions, inadequate work planning, poor communications, and improper use of procedures that could have resulted in equipment damage.
- B. **Description:** After a back flow preventor valve failed a routine check, maintenance personnel suggested there may be a leaking gate valve. The shift operating manager and the maintenance supervisor determined that a single valve, non-documented lockout would isolate the leaking valve. They did not refer to system piping or electrical drawings. The operating manager instructed the maintenance supervisor to ask the shift technical advisor to evaluate the situation. The shift technical advisor and a maintenance mechanic walked down the piping to determine which valves were necessary to provide single and double lockout isolation. They also did not use the system piping or electrical drawings and, therefore, did not realize that the valves identified for the double lockout would cut off cooling water to both instrument air compressors.

The mechanic obtained a single Do-Not-Operate tag from the shift manager, closed the valve, and hung the tag. When he breached the valve bonnet on the leaking valve, water came out of the valve. The mechanic returned to the control room, obtained two more tags, logged them in the non-documented lockout log, and left the log open to his entry for the shift manager. He went back to the field, closed the valves and installed the tags, and left the area.

- C. **Lessons Learned:** Investigators determined that the following causes contributed to this event:
- inadequate pre-work planning,
 - inadequate communications to affected personnel,
 - lack of understanding and experience on non-documented lockouts/tagouts,
 - failure to follow the procedure for non-documented lockouts/tagouts, and
 - failure to use drawings to determine the effect of lockouts/tagouts.

Investigators also determined that proper isolation of the leaking valve required lockouts of seven valves and two electrical circuits.

- D. **Corrective Action:** The facility manager initiated the following corrective actions. He suspended all non documented lockouts/tagouts until personnel are retrained on non-documented lockouts/tagouts. He ordered an evaluation and modification of the work planning program and re-training of operating personnel when the modification is completed. He also stressed to his shift managers the need to communicate system configuration changes to auxiliary operators. He ordered clarification of the criteria for emergency lockout/tagout removal and the re-training of the operators.